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VIRGINIA POLYTECHNIC INSTITUTE
AND STATE UNIVERSITY
BLACKSBURG, VIRGINIA

OCTOBER 1976

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Report summarizes theoretical assumptions of management by objectives; reviews literature on use of MBO in private and public sectors; uses empirical data collected by survey of MBO applications at the Dahlgren Laboratory of the Naval Surface Weapons Center as a means of indentifying strengths and weaknesses of this approach; empirical data used for extrapolation of methods which further research may prove can set more precise milestones; empirical data used to construct a model organization for doing MBO in a Navy Research and Developement Lab.

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FORWARD

During the last decade, the new system of public administration developing in the United States has been management by objectives. Since 1973, MBO has been required by the federal government, and this report takes a look at how this managerial technique is used by a Navy research and development laboratory. Because of this agency's scientific work, a research team consisting of professors in engineering, mathematics, science and public administration conducted the study in order to provide an analysis of all administrative and technical aspects of the MBO process.

The researchers want to thank Captain C. J. Rorie, U.S.N., Commanding Officer of the Naval Surface Weapons Center, and Mr. James E. Colvard, the Technical Director of NSWC, for authorizing the study at the Dahlgren Laboratory. Special appreciation is also due Dr. Robert T. King, Associate Director of the Organizational Effectiveness Research Programs at the Office of Naval Research, for supporting the research effort.

Management by Objectives in a Navy R and D Laboratory

I. Introduction

The attempt at devising better methods of public administration probably began as soon as the first political organization was established, and the effort will undoubtedly continue as long as there are institutional arrangements requiring human direction. So far the eternal search for the most efficacious means of governmental management has produced a succession of theories each of which in turn has vainly promised to do more by way of improving the economy, efficiency and overall effectiveness of operations. For example, Gulick and Urwick's machine model was advocated as the key to organizational success in the pre-World War II period,[1] but it was superceded by the postwar popularity of Herbert Simon's administrative behavior and decision-making approach.[2] During the 1960's, the Planned Program Budgeting System was championed as the foundation of management science in the public sector[3] until it was persuasively contended that a more comprehensive choice for the future would be management by objectives.[4] Unquestionably, another theory will

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[1]Luther Gulick and L. Urwick, eds., Papers on the Science of Administration, New York: Institute of Public Administration (1937).

[2]Herbert A. Simon, Administrative Behavior, 2nd Ed. New York: MacMillan (1957).

[3]Allen Schick, "The Road to PPB, the Stages of Budget Reform," Public Administration Review (December, 1966), 243-258.

[4]Chester A. Newland, "Policy/Program Objectives and Federal Management: The Search for Government Effectiveness," Public Administration Review (January/February 1976), 20-27.

challenge MBO in the next decade, but in the meantime the applicability and suitability of management by objectives should be studied and evaluated before it is too quickly discarded for an untested fad of the 1980's.

In pursuance of the need to know more about the operational aspects underlying the theory of management by objectives, this paper reports the results of research conducted at the Dahlgren Laboratory of the Naval Surface Weapons Center for the purpose of empirically ascertaining if MBO is a feasible technique for managing a Navy research and development laboratory.

II. Origin of MBO in the Private Sector

The idea of management by objectives was first articulated as a theory by Peter Drucker who found its genesis in business practices. In fact, he notes that it was initially used by the DuPont Company after World War I and by General Motors in the 1920's. Reviewing his experience with "Management by Objectives and Self Control" at GM, Alfred P. Sloan, Jr. said that:

> The concept of coordinated decentralization evolved gradually at General Motors as we responded to tangible problems of management. ...at the time its development began, some four decades ago, it was clearly advisable to give each division a strong management which would be primarily responsible for the conduct of its business.[6]

The policy followed by General Motors was typical of other early

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[5] Peter Drucker, The Practice of Management, New York: Harper and Row (1954).

[6] Alfred P. Sloan, Jr. "The Management of General Motors", in Organization Theory: Selected Readings, ed. by D. S. Pugh, Baltimore: Penguin Books (1971), 182.

management programs in that the principal concern was over the decentralization of authority in the organization rather than with the participatory philosophy which characterizes modern MBO. The change in emphasis came about largely through the widespread acceptance of Douglas McGregor's perception of human nature which he contended should be the basis for determining leadership styles.[7] In order to adjust authority to match workers' motivation McGregor developed two models, Theory X and Theory Y, which he believed could be applied to most work situations. The essence of these representations was that:

I. Theory X: the traditional view of direction and control

1. The average human being has an inherent dislike of work and will avoid it if he can.

2. Because of this human characteristic of dislike of work, most people must be coerced.

3. The average human being prefers to be directed, wishes to avoid responsibility, has relatively little ambition, wants security above all.[8]

II. The Assumptions of Theory Y

1. The expenditure of physical and mental effort in work is as natural as play or rest.

2. External control and the threat of punishment are not the only means for bringing about effort toward organizational objectives. Man will exercise self-direction and self-control in the service of objectives to which he is committed.

3. Commitment to objectives is a function of the rewards associated with their achievement.

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[7]Douglas McGregor, The Human Side of Enterprise, New York: McGraw-Hill (1960).

[8]Douglas McGregor, "Theory X and Theory Y," in Organizational Theory: Selected Readings, ed. by D. S. Pugh, Baltimore: Penguin Books (1971), 305-6.

4. The average human being learns, under proper conditions, not only to accept but to seek responsibility.

5. The capacity to exercise a relatively high degree of imagination, ingenuity and creativity in the solution of organizational problems is widely, not narrowly, distributed in the population.

6. Under the conditions of modern industrial life, the intellectual potentialities of the average human being are only partially utilized.[9]

Once he had categorized the human element, McGregor next sought the method by which output and productivity could be maximized. He concluded that this condition could only be attained by the integration of both organizational and personal objectives in a decision-making process which not only incorporates them at the departmental and lower managerial levels but also includes the goals and values of the workers. This thesis, which is widely accepted today, is that the work force is a rational group which can be of much assistance to an enterprise if it utilizes a system of participative management.

In building upon the concepts underlying both General Motors' "Management by Objectives and Self Control" and McGregor's behavioral theorem of participative management, George Odiorne devised a decentralized procedure for MBO implementation in business organizations. It starts with the top echelon in the organization annually making a broad, general statement of mission and purpose to guide the decisional process. Acting within the established perimeter, each lower managerial level then goes through the following stages: setting objectives and milestones in consultation with subordinates; evaluating results against the agreed

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[9] Id. at 315-316.

upon objectives and milestones; reviewing organizational performance in meeting milestones and satisfying objectives; and defining goals and objectives for the next year.

Concerning the operation of his MBO procedure, Odiorne prescribed several steps to assure its success. To begin with, consultation between superior and subordinate is to be conducted in a closed session at which time objectives common to the whole organization and its mission are identified. Following these guidelines, the subordinate then prepares a list of objectives to be accomplished in the coming year. After discussion and agreement on the subordinate's objectives, two typed copies are made of the final draft, one of which is kept on file by each participant. During the year, the superior checks on the subordinate to see if his promised milestones are reached. At the end of the fiscal year each subordinate prepares a brief statement comparing his objectives with his performance. This record is then reviewed in detail in a joint session with the supervisor. In the last stage of Ordione's mechanics the superior and subordinate are renewing the cycle by again deriving objectives common to the entire organization and its mission, but this time they are equipped with the history and precedent of previous years' performance which collectively serve as tools to refine each acceptable objective.[10]

The Odiorne pattern has been adopted by management textbook writers and has become the standard practice of businesses which have instituted formal MBO programs. One instance is described by the Vice President of the Wells Fargo Bank in San Francisco, John B. Lasagna, who installed the

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[10]The preceding discussion is condensed from George S. Odiorne, Management by Objectives: A System of Managerial Leadership, New York: Pitman Publishing Corporation (1965), pp. 68-73.

MBO system in his organization over a period of three years. To prepare for the implementation of MBO, he had workshop sessions for all participants, and managers underwent supervised practice in writing objectives. Throughout his program Lasagna has stressed flexibility in that objectives should be easily changeable to meet contingencies and shifts in interest. Moreover, the procedure works best when no more than three to five objectives are written by each manager who is further charged with the responsibility to state verifiable criteria for evaluation.[11]

Another example of MBO's successful implementation is provided by the Jim Walter Corporation which became the nation's largest producer of building materials and saw its sales quadruple from 1968 to 1973 after it converted to management by objectives. This company was a different version of the Odiorne model in that initially it merely provides research from the top to the planning and sales office managers, many of whom are allowed, depending upon situational requirements, to formulate their own objectives. Before they are finalized, headquarters will review these objectives, but it can only make revisions with the concurrence of the manager. His progress in meeting milestones is monitored by a staff audit unit at headquarters, and in the event of slippage in maintaining his schedule, the manager will probably receive a telephone call offering assistance rather than a reprimand.[12]

Although MBO has been successful in other cases similar to the aforementioned ones, its adoption has frequently been discouraged by

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[11]Cf., John B. Lasagna, "Make Your MBO Pragmatic", Harvard Business Review (November-December, 1971), 64-69.

[12]See, Peter Vanderwicker, "'Collegial Management' Works at Jim Walters Corporation," Fortune (March 1973).

associated problems. The major shortcomings reported include: distrust of the system, resentment of a forced program, objection to additional paperwork requirements, reluctance to consult with superiors or with subordinates on work essentials, overly narrow focus followed in writing objectives, inordinate amount of time involved in resolving conflicts between bottom-up and top-down perceptions of desirable objectives, separation of rewards and promotions from performance in implementing MBO, and inability to measure objectives.[13] While some of the above problems are serious, they are not immobilizing companies using management by objectives, and only in the most extreme cases are they providing less efficiency than what was encountered under "Theory X" or what Drucker calls "Management by Drives."[14] In fact several empirical studies raise doubts about the validity of the alleged disadvantages.

In Management by Objectives: Applications and Research, Stephen Carroll, Jr. and Henry Tosi, Jr. describe a MBO system they set up for the Black and Decker Corporation.[15] After giving it plenty of time to begin functioning normally, Carroll and Tosi followed up on the process, distributing a questionnaire to approximately 150 managers. First of all, they learned, contrary to expectations, that none of the job characteristics had changed significantly after installation of MBO. Respondents were no more or no less satisfied with their jobs

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[13]Ross A. Webber, Management: Basic Elements of Managing Organizations, Homewood, Illinois: Irwin Co. (1975), 351-355.

[14]Peter Drucker, Management: Tasks, Responsibilities, Practices, New York: Harper and Row (1973), 437.

[15]New York: MacMillan (1973).

and salaries than they were under the previous policy. However, on the positive side, managers did believe that MBO resulted in better and fairer appraisals of performance and that overall it was a better method for planning work, motivating personnel, and maintaining an effective communications network.[16]

It was also reported by Carroll and Tosi that other researchers had found the same results in a study conducted for the General Electric Corporation. In that case it was noted that managers operating under an old evaluation technique did not change their attitudes or behavior in the areas measured, whereas the managers applying MBO indicated that their superiors were giving them more help in improving their performance on the job and in long-range organizational planning. In addition, superiors were rated as being more receptive to new ideas and innovation. With regard to immediate job concerns the managers using MBO reported that it facilitated planning for completion of projects, and furthermore, they concluded that this approach made better use of their abilities and experience.[17]

The effects of MBO are not limited solely to private enterprise in the United States as they were also discovered to be by-products in twelve British companies using management by objectives.[18] In all cases the directors and superviosrs are satisfied by the procedure even though it has not produced extraordinary economy or efficiency. Instead, the

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[16] Id. at 64-65.

[17] Id. at 122.

[18] John W. Humble, ed., Management by Objectives in Action, New York: McGraw-Hill (1970).

major contribution of MBO in the British companies has been increased administrative effectiveness through a more intelligent use of human resources. An example of such results concerns Colt Heating and Ventilation Limited where before the conversion to MBO the following conditions prevailed:

1. An extreme workload on senior executives
2. An impression that middle managers were not operating efficiently
3. Poor financial communications
4. A lack of long-term objectives
5. An adverse trend in the level of company overheads.

Under MBO a number of changes occurred among which the most significant were:

1. Management training programs have eliminated problems (1) and (2) listed above.
2. The organization structure was refined by eliminating unclear areas of responsibility, merging departments, and giving each manager the proper span of control.
3. Performances which had been average and acceptable were exceeded by large margins.
4. Better delegation and less interference by superiors was obtained.
5. There was more time and energy available for planning.[19]

Despite these improvements the British commentators cautioned against considering MBO to be a panacea. Likewise, it is contended that in view of the problems encountered by businesses organized around MBO it should be expected that an equal or greater number of difficulties will develop

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[19] *Id.* at 44-45.

when the system is injected into public administration.[20]

III. MBO in the Public Sector

As a result of much pressure to make government agencies more accountable and to improve managerial effectiveness, MBO has looked promising to public administrators because in the private sector its use has stimulated efforts to become more efficient while at the same time the responsibility for performance has been clearly located at each hierarchical level in the organization. Impressed by its accomplishments in business administration, the Executive Branch promulgated MBO as an official federal government policy by issuance of a Presidential Memorandum in 1973. Many observers have attributed the introduction of MBO in national agencies to Harvard Business School graduates Roy Ash and Fred Malek who respectively became Director and Deputy Director of the Office of Management and Budget. While it is true that Ash and Malek were MBO enthusiasts and were the engineers of universal MBO in the federal bureaucracy, it is incorrect to give them credit for anything more inasmuch as a seminar conducted on MBO in 1970 at the Federal Executive Institute revealed that the concept of MBO was then being successfully used by a number of federal agencies among which were listed the Internal Revenue Service, the General Accounting Office, the National Park Service, and the Federal Aviation Agency. Shortly after 1970, Fred Malek, who was at that time the Undersecretary of the Department of Health, Education and Welfare, applied MBO to that sprawling department

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[20] Jong S. Jun, "Management by Objectives in the Public Sector," Public Administration Review, (January/February, 1976), 1-2.

with good results. The change gave top management more control over the large, complex organization, and it appeared to improve communication within the Department.[21]

Prior to the adoption of MBO in HEW several problems had persistently hindered performance. They were:

1. Program successes were often measured by the wrong criteria, e.g., the number of grants awarded rather than the number of people served or problems solved.

2. There was a dearth of communications between levels in the organization, resulting in a lack of information for policy makers at upper levels and a lack of guidance for managers at lower levels.[22]

These deficiencies were corrected by instituting a MBO cycle which had program managers formulate results-oriented objectives for their programs at the time of budget preparation. In this process program managers justify each request for funds by reference to the objective which will be attained by the expenditure. In a like manner the Secretary of HEW selects the objectives which he considers worthwhile and requests funds from Congress to carry them out. After appropriations are secured, the Secretary then establishes priorities for the objectives to be fulfilled by the program managers. Their performance is checked bimonthly, and there is a comprehensive evaluation at the end of the fiscal year.[23]

Not only is the MBO system installed in HEW program rather than peopoe oriented, but it also does not reach down very far in the organization. In this respect the Malek model does not approximate the

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[21]Frank P. Sherwood and William Page, Jr., "MBO and Public Management," Public Administration Review (January/February, 1976), 6-7.

[22]Rodney A. Brady, "MBO Goes to Work in the Public Sector," Harvard Business Review (March/April, 1973), 67.

[23]Id. at 68.

procedure constructed by Odiorne[24] with the consequence that the advantages gained from the approach employed by the private enterprise will not permeate a government agency from top to bottom. Yet, this type of MBO was enacted by OMB in 1973 as "From the outset, Roy Ash insisted that what he wanted was a results-oriented style and he preferred not to tie it to a rigid form of MBO or any other narrow framework."[25] The initial thrusts given MBO were that it was to be used first as a vehicle for continuous program review and coordination and secondly as a tool which clarifies for program managers the expected results and standards they should apply in evaluating accomplishments.[26] Therefore, MBO in the public sector was operationalized under assumptions which are different from those followed in the private sector.

As planned by the Director of OMB, implementation of management by objectives throughout the federal establishment has not been rigid and uniform; but, nevertheless, there has been a great deal of success as reported by one researcher who studied effective programs in the Environmental Protection Agency, Forest Products Laboratory and the Department of Health, Education and Welfare.[27] On the other hand, a number of agencies are still trying to determine what MBO means while some which claim they are using the new system have not actually altered their old procedures. The National Labor Relations Board, for example, initiated

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[24] See the discussion accompanying note 10, supra.

[25] Chester A. Newland, "Policy/Program Objectives and Federal Management: the Search for Government Effectiveness," Public Administration Review (January/February, 1976), 20.

[26] Id. at 21.

[27] Fred Luthans, "How to Apply MBO," Public Personnel Management (March/April, 1976), 84.

in 1960 what has been a successful and uncomplicated performance evaluation system for managing the processing of cases. With the advent of MBO the NLRB has merely changed the name of its old method to conform with the new requirement.[28] By contrast though there are agencies for which the implementation of MBO has meant a radical departure from past practices. An illustration of this point is provided by the effort of the Justice Department to put a departmentwide MBO system into effect by providing detailed instructions in a handbook which is supplemented by manuals that have been developed at lower management levels for the various subunits.

An example of the approach taken in the Justice Department is furnished by the manual entitled, Management by Objectives: A Corrections Perspective. It contains a definition of the MBO process in both private and public administration along with an explanation of the need for increased managerial effectiveness and a description of MBO's applicability for managing corrections.[29] The main purpose of the manual, however, is not informative but rather it is to enforce a uniform procedure for the formulation of objectives by stipulating the following guidelines:

1. Objectives should be expressed as public benefits whenever possible.
2. Written objectives should start with the word "to" followed by an action verb.
3. Objectives should specify a single key result to be accomplished.

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[28]Newland, op. cit., at 24.

[29]Mark L. McConkie, Management by Objectives: A Corrections Perspective, U. S. Department of Justice (July, 1975), 1-5.

4. Objectives should specify a target date for accomplishment.

5. Objectives should specify maximum cost factors (dollars, man-hours, materials, etc.).

6. Objectives should be realistic, attainable, and challenging.

7. Objectives should be as specific and quantitative (and hence measurable and verifiable) as is possible.

8. Objectives should specify only the "what" and "when"; they should avoid the "why" and "how".

9. Objectives should relate directly to the accountable manager's role and missions and to higher level roles, missions, and objectives.

10. Objectives should be readily understandable to those who will be contributing to their attainment.

11. Objectives should be consistent with the resources available or anticipated.

12. Objectives should avoid or minimize dual accountability for achievement when joint effort is required.

13. Objectives should be consistent with basic organizational policies and practices.

14. Objectives should be willingly agreed to by both superior and subordinate without undue pressure or coercion.

15. Objectives should be written with a copy kept and periodically referred to by both superior and subordinate.

16. Objectives should be communicated not only in writing, but also in face-to-face discussions between the accountable manager and those subordinates who will be contributing to its attainment.[30]

Although the steps prescribed for carrying out management by objectives are designed to systematize decision-making, there are some unintended results in that the regulatory nature of such a process will eventually produce rigidity, red tape and inertia. In addition so much time will be consumed in preparing objectives in accordance with the instructions

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[30] Id. at 9-12.

that the main output of a work unit will probably be paper instead of completed tasks. The Justice Department's policy also defeats one of the primary intentions of MBO which is to delegate more authority to subordinates. Before MBO was required, the lower echelons in the Department were given a great deal of discretion to determine how they would handle their responsibility with the superior mainly checking results. Now, it appears that MBO may centralize authority to a higher degree than the old arrangement did.

Besides the problems noted in connection with the Justice Department, it has been pointed out that public administration in general is faced with a number of constraints such as legal restrictions, political climate and budgetary requirements which are not applicable in private enterprise.[31] While these differences must be taken into account, it would not seem, however, that they should prevent a well executed MBO process from improving the utilization of manpower and managerial talent because the greatest danger to MBO in the public sector is inflexibility in application and a creeping document paralysis. If top administrators develop the same perspective which prevails in business, only a few documents are needed to make MBO successful; but if all members of an agency are required to file their objectives in a central location or with an MBO staff for the justification of budgetary and similar requests, the agencies will in time begin to choke on the excessive paper required as was the case under PPBS.[32] This point was validated by the study of the Dahlgren Laboratory.

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[31]Luthans, op. cit.

[32]Allen Shick, "A Death in the Bureaucracy: The Demise of Federal PPB," Public Administration Review (March/April, 1973).

IV. MBO and Navy R and D Management

The data for this section was collected through interviews conducted with the administrators and professionals of selected divisions and their branches within each technical department at the Dahlgren Laboratory. In the sessions with managers the central focus was on such questions as how is MBO practiced, what is its utility as a management tool, and is there a correlation between its success or failure and the form of organization used. At the next hierarchical level the professionals who are engaged in project work were interviewed for the purpose of finding out what effect, if any, MBO had on their performance.

A. Derivation of MBO Process

As this survey progressed it became evident that under a variety of different titles a number of divisions and branches of the Dahlgren Laboratory had been using the basics of management by objectives long before the Presidential Memorandum of 1973 required it for the federal government. This practice was a logical evolution as a consequence of two factors. First, the engineering and scientific methodologies which are naturally prevalent in a R and D laboratory producing weapons systems prescribe a careful step by step planning of a project from top to bottom within an organizational unit. Second, the National Industrial Funding concept under which the Navy laboratories operate requires the setting of fairly comprehensive milestones showing how much time, money, manhours, etc., will be needed to complete a proposed weapons system.[33]

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[33]Briefly, this policy means that Congress appropriates money to the various Naval Systems Commands to which the R and D laboratories submit proposals for developing weapons systems. The Commands approve projects by funding them under a commercial type budget which facilitates maintaining fiscal control and measuring financial feasibility.

As a result of the aforementioned parameters a MBO formula which is very similar to the one designed by Odiorne[34] is found at Dahlgren. Although its application varies considerably among the units of the base, a generalized model of the procedure is presented in Figure I with the arrows indicating the flow of objectives. The vertical axis is the management chain, and the horizontal axis represents time. Albeit desirable, scalar analysis of Dalhgren's MBO process is not possible because of the variability in degree of effort among different projects. It should also be explained that while organizational objectives are established for an entire year, some or all of the procedures between A and D on the time axis may be repeated once or twice during the annual cycle as projects are altered, dropped or redirected. Also, in some instances objectives are modified between division, branch and project levels as work situations necessitate adjustments. In all cases though, the process involves negotiation between superior and subordinate at each echelon in the chain of command as advocated by Odiorne, and in contrast to the previously mentioned Malek Model,[35] MBO at Dahlgren permeates the entire organization.

B. Formulation of Objectives

Although the objectives of an organizational component are jointly deliberated by supervisors and subordinates, the intensity of this interaction actually varies among Dahlgren's hierarchical levels according to the entry point of the sponsor's money. That is to say, the greatest

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[34] See note 10, supra.

[35] See the text accompanying note 24, supra.

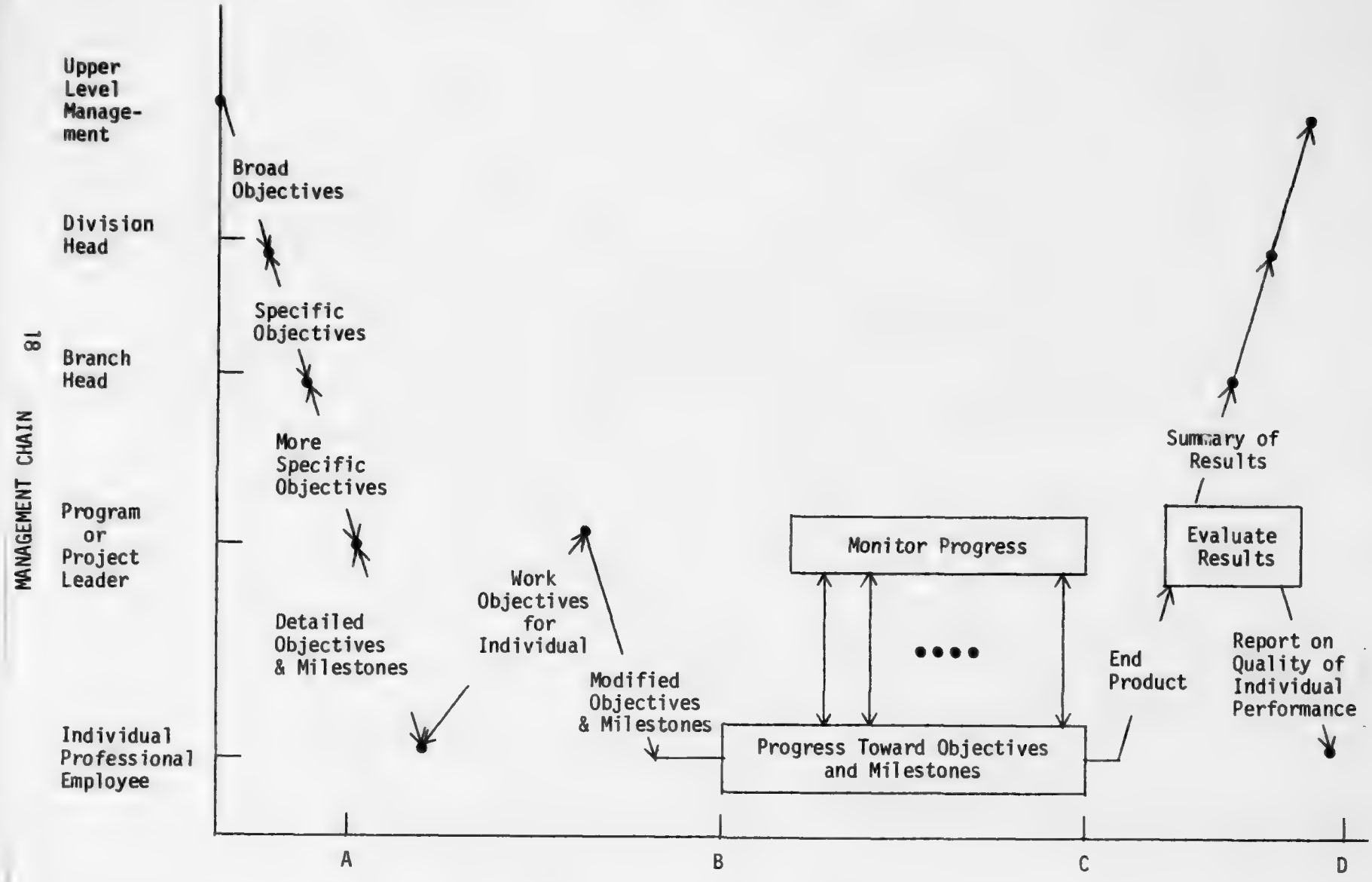

Figure 1. Generalized MBO Chart

concentration of effort on formulating objectives is at the point where the Navy Command, which grants the money to the Laboratory, has its maximum interface. In theory such access should only be at the top of the hierarchy which then arranges for the participation of its work units in a project, but in practice each echelon of the Dahlgren Laboratory may initiate contact directly with a sponsor depending upon the complexity and magnitude of a proposed weapons system. This does not mean, however, that uncontrolled decision-making takes place between elements of the Laboratory and outside groups because in fact the entire organization is coordinated through common objectives which are formulated by the Odiorne method.

To begin with, Dahlgren is typical of all Navy R and D laboratories in that it has a corporate structure combining civilian and military personnel under the leadership of a board of directors which is comprised of the ranking Navy Officers and civilian administrators who manage the station and head the line and support departments. This body is charged from above in the chain of command to serve the needs of strategic and surface fleet weapons systems, and from time to time it negotiates changes in the Laboratory's mandate with its superiors in the Navy Department. The internal formulation process begins as the broad mission statement is broken down into more specific objectives by the board of Directors which delegates them to the R and D departments.[36] In this way top management establishes guidelines which allow for contact between

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[36]In a nutshell these functions at Dahlgren encompass quite diverse tasks such as maintaining testing and evaluation facilities, manufacturing weapon systems prototypes for large scale production, providing computational services along with fostering research and development capability.

lower hierarchical levels and sponsors without fear of any deviation from the overall laboratory objective because, as illustrated by Figure I, the objectives become more narrow in scope and more specific in content as they are transmitted downward in the organization. Thus, the jurisdiction of subordinate administrators is limited to categories of weapons systems which have been defined successively in turn by the higher echelons.

In the same manner that the process of formulating objectives becomes the means by which managerial control over agency decision-making is attained it also determines the entry point for new programs and projects. Accordingly, a rather standard policy has developed at DL. First of all, large scale programs which involve the participation of an entire department or of several department almost always enter the system at the top where the objectives will be negotiated by the board of directors who assess a proposal for its conformity with the base mission and who protect existing objectives from the conflict or disruption which can result from taking on a new assignment. Once the directors have settled on the objectives of a large scale project the MBO process functions as depicted in Figure I.

With regard to medium or small scale projects these will most likely come on board at the division or branch or in some instances at the program/project level. When one of these units contracts with a sponsor, the flow of objectives emanates from that point. For example, in the case of a branch which can secure funding to develop a weapon system the internal negotiation of objectives will be most involved with the division chief who is responsible for making sure that the scope of the proposal is consistent with Laboratory, departmental and division goals.

The division head will also analyze the project's objective in terms of what impact it will have on available and required resources. His decision of approval is forwarded to upper levels in the chain of command where it will be treated as basic information unless a conflict with other missions is discerned. In that event, negotiation will commence between the division and its superiors. Otherwise, the chief's involvement in acceptable objectives, after he and the branch head have reached an agreement, will be to support the project as a "troubleshooter" when personnel, resource or technical problems arise.

Following a favorable decision, there is next a downward flow of objectives as the branch head negotiates for specificity with his program/project leaders who in turn match the abilities and interests of their professionals with the defined statements of what is to be accomplished (Point A, Figure I). The approach used to communicate tentative assignment of objectives varies, according to the circumstances, from private conference to group meeting to memorandum. Regardless of how each professional receives the information, he is given a short period of time to study his recommended tasks. Then both parties negotiate a final settlement detailing the objectives which may be identical to the original or which may be modified at the request of the professional (Point B, Figure I). In many instances the last phase is unnecessary because the employee has been involved in developing a proposal for presentation to a sponsor with the result that the professional has agreed in advance to carry out certain objectives if funding for the project is forthcoming.

The importance of what has been required up to this point for the

process of formulating objectives is that top management, with the participation of subordinate administrators in deriving a set of organizational objectives, has established a guidance system for the R and D activity of the Laboratory. The investment of some time and effort to make this part of the MBO process succeed is more than justified by the sense of mission which pervades the entire organization, thereby providing an essential parameter for making the broad delegation of authority and responsibility needed to encourage innovation in research and development endeavors.[37] Actually, the largest percentage of time expended on completing a weapons system is found between B and C on the time axis of Figure I where the work toward achieving the objectives of the professional employee takes place. During this time span, the program/project leader will periodically monitor the progress of the work groups. It is not at all unusual that at this point frequent modifications in an objective must be made as a result of sponsor requests or unexpected technical problems. Because of their specific nature, changes in objectives at the program/project level seldom have any impact on those formulated in the upper echelons. In fact the requirements of MBO at the bottom of the hierarchy are not greatly dissimilar from the stipulations imposed by other managerial techniques to maintain accountability and responsibility for the completion of assigned tasks. The only significant difference is that by having a negotiated objective both superior and subordinate have a mutually comprehensible benchmark for gauging the progress of a project and for evaluating job performance, whereas under opposite

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[37]At this point it should be noted that subsequent discussions will indicate how the pitfall of "administrivia" can be avoided through proper organizing to execute MBO.

administrative systems the subordinate is not always sure what is expected from him by his position. This understanding was the advantage most emphasized in interviews at the Dalhgren Laboratory by employees of units where the MBO procedure was completely operative from top to bottom. Yet, it is obvious that this advantage cannot be gained unless the content of objectives meet certain specifications.

C. Contents of Objectives

This study verified the point made earlier about uncontrolled or undirected management by objectives producing more paper than results.[38] For this reason alone it is essential that the content of objectives be succinct, but in addition the list of objectives at each organizational level should be limited to precisely what a unit intends to accomplish in the way of project work. Therefore, an objective should be defined in terms of results or conditions to be achieved rather than by the activities to be performed, and it should only deal with a single end result instead of combining several commitments. Also, an objective is more effective if it states positively what is to be done while avoiding any mention of what is to be excluded. And, the meaningful objective will provide milestones by which achievement and progress can be measured because without target dates an objective has no real purpose. Unfortunately, there are some administrators at the Dahlgren Laboratory who fall into the trap of omitting the time frame from the content of their proposed objectives. One example uncovered was "To explore and to apply _____ technology to new areas."[39] Written in this form the preceding statement

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[38] See notes 30-32, supra.

[39] Because of national security classification, the project technology in this instance cannot be identified. Hereinafter, blanks will denote such cases.

merely expresses a future intention, and until a date is set it cannot be classified as an operational objective. This problem was not common to any one group of administrators as it was found in numerous cases, nor was it always a frequent occurrence for the same administrator. For instance, the division chief who wrote the above bad example also included in his list for that year the following paragon: "Define Project _____ for transition to [another organizational component] by 6/30/74." This objective was implemented by the branch heads who within the milestone more precisely defined their responsibility which in turn was broken down into specific tasks by the project leaders, most of whom had deadlines to meet before the target date. From formulation through final negotiation each step of this MBO case illustrates exactly how the content of objectives is to be given greater clarification as the process reaches the level of project management where the actual work takes place.

The Dahlgren survey also encountered several other practices involving deficiencies associated with the content of objectives. On one hand broad generalities concerning personnel policies and other auxiliary functions such as supply were too frequently included along with organizational objectives. An example is the statement of one administrator who planned to "Develop colleagues through formal training and help them find purpose and reward in their work lives." Since this kind of objective directly concerns an employee's career rather than the entire work unit, it should be handled separately with each individual; and auxiliary or housekeeping goals which do not affect the total enterprise should be strictly the business of the work unit.

The other fault discerned in the content of objectives was an overuse

of motherhood expressions such as "improve managerial effectiveness," "achieve greatest efficiency," "attain highest quality possible," "improve service to the Fleet," "decrease delay time," "communicate with other departments," "provide more timely assistance," "maintain morale at a high level" and so forth. Despite their well-sounding intention, administrative platitudes and descriptions of nebulous activities, even when accompanied by milestones, do not constitute organizational objectives because they do not set a specific direction inasmuch as they can be manipulated or twisted to fit almost any definition on occasion.

Considering that management by objectives is an incipient process in federal administration, it is not surprising that the above discussed problems with content exist. In some respects they do not seem to be serious impairments, but regardless of what is their impact, they should be corrected in the interest of providing a more clear-cut and effective procedure. This end can be easily attained by first promulgating a guideline for the writing of organizational objectives solely in terms of project relevance. Secondly, and of greater significance, the setting of milestones should be required for each objective. Unless these rules are enacted, the omission of a milestone plus imprecise and misleading content in an objective will make MBO a meaningless exercise in "administrivia."

D. Setting Milestones

At first glance it might appear that establishing milestones is a relatively easy matter involving an estimation of how much time will be needed to complete an objective. Yet, the random setting of a milestone

is not likely to have much validity, as discerned in some quarters at Dahlgren, and herein lies a major defect in the practice of management by objectives because the milestone which will provide the guidance and information needed by an organization can only be derived from a careful calculation and weighing of a number of factors. Therefore, MBO is not merely a procedure for getting results but ideally it attains them within a definite time period. A noted consultant and teacher, Paul Mali, contends that if time schedules are properly computed, MBO will achieve greater success than other managerial techniques on the grounds that:

> Time is reliable, consistent, and regulatory. Managing by objectives sets expected results on the basis of the clock and the calendar to take advantage of this regulatory and reliable pace setter. In so doing, MBO sets up a sequential pace that works against Parkinson's Law which states that work is elastic and will fill the time set for its completion. The practitioner who sets realistic but tight time periods for jobs to be done acts against the elasticity of work, which results in greater productivity. He uses shorter periods of time to achieve the same amount of work. Time for the practitioner becomes a tool for getting greater productivity.[40]

Although much of the process for deriving time baselines is judgmental rather than arithmetic, the research conducted at the Dahlgren Laboratory clearly identifies certain parameters which determine milestones in Navy research and development work, no matter how a project begins or comes on board and regardless of its nature.

For a large scale, multi-faceted program which involves a number of participating organizations there will be a common deployment date for operation of the weapon system.[41] As a result, all of the milestones for

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[40]Paul Mali, Managing by Objectives, New York: John Wiley and Sons (1972), 15.

[41]For an account of such a program, see Harvey M. Sapolsky, The Polaris System Development: Bureaucratic and Programmatic Success in Government, Cambridge: Harvard University Press (1972).

the subprojects are driven by the system. That is to say, subproject milestones must be achieved within the designated time frame because the deployment date is generally an inflexible product of foreign policy, Defense Department strategy and a reaction to potential or real threats.[42]

In the case of medium and small scale projects which for developmental or tactical reasons are transferred from one laboratory to another, the new installation usually inherits a target date for completion. While there may be room for renegotiating some parts of the old schedule, the previously set finishing mark normally will not be appreciably changed. Again, milestones are computed within the externally imposed limits.

When projects are internally generated, the setting of mileposts becomes a function which is more concerned with ascertaining failure or success. If, for example, it becomes apparent through testing that the development of an idea for production will take too long for it to be utilized very much by the Fleet before obsolescence occurs, then logically the project is dropped. On the other side of the coin, if it is demonstrated by experiments or tests that the conversion of an idea into a useful system can be accomplished within a reasonable period of time, the project next seeks approval in the form of financial support. Under the National Industrial Funding policy,[42] a sponsor must be secured, and his support of a project will depend largely upon a suggested schedule of periodic testing to demonstrate feasibility as

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[42] Id. at 139.

[43] See note 33 supra.

well as the proposed completion date. Most likely the original time posts will be changed through negotiation between the sponsor and the project manager.

Since in practically all cases the setting of milestones in a Navy R and D Laboratory such as Dahlgren will be influenced to a considerable degree by outside forces, the internal process by which time marks are derived must be as accurate as possible. Unquestionably, the proper attuning and sequencing of events to satisfy external demands requires a great deal of experience, "know-how" and skill, but the key question at this point is what constitutes experience? How, for example, can realism be distinguished from an overly enthusiastic "can-do" estimate? The answers to these and other related questions are to be found in the analysis of several identifiable factors.

To begin with, experience is obviously an important criterion to be utilized in the calculation of milestones, but it can at times be most difficult to define or to translate into a meaingful guideline. In a situation where technological advances produce a new generation of the same weapon system, the experience gained from working with the ancestor model not surprisingly facilitates decision-making for the second program. For these projects the manager can draw upon the precedents denoted by past performance in setting milestones. In addition he knows from experience how to increase the probability of reaching a milestone on schedule by using subprojects. For example, when the objective is to deliver by a specified date a software guidance package for missile targets inside a circle of radius R, then the administrator immediately knows from such previous assignments that

success in completing the project on time requires a subproject for developing a sufficiently accurate gravity model. Thus, the major questions to be answered in setting milestones for this goal are: (1) at what point must the gravity model be ready for incorporation into the total project: (2) what proportion of available resources must be allocated to this task in order to mesh with the deadlines of other components; and (3) which personnel should be assigned to the subproject to give the right mix of expertise for doing a good job on schedule? On the basis of the answers formulated for these questions the decision-maker will establish milestones for the subproject, and if he believes that by placing highly competent personnel in the gravity model group an earlier milestone is feasible, then other milestones for the entire project may be accordingly adjusted.

Unlike the preceding process in which experience plays the predominant role in the selection of alternatives there are greater difficulties involved in determining the milestones of programs that are departures from current applications of science to weaponry. The administrator in this case does not have much, if any, relevant job history to guide his decisions in making sure that he has adequate money, people, equipment resources and so on to do each task on time. Therefore, to minimize uncertainty in the setting of time posts, the manager will usually try to have a large number of employees with whose qualifications he is familiar transferred to the new group. As a result of knowing something about the ability of these individuals to handle particular kinds of technical problems the project leader can make better estimates of how long it will take to complete different phases

even when the work group has some members of unknown capacity. If this plan cannot be used for whatever reason, the supervisor then must either pull milestones out of his hat or pray for divine guidance. In short, the lack of pertinent experience leads to much "seat of the pants" judgment which explains why things go wrong and undesirable complications such as time overruns occur in projects.

Not only is experience, or the lack of same, a significant variable in the drawing of calendar dimensions in management by objectives, but it also contributes to the anticipation of contingencies and problems that will disrupt the progress of a project. This parameter first concerns matters on the order of uncertain funding in the future. Whenever a program is criticized to the degree that a continuance of Congressional budgetary approval for the item is uncertain or it is apparent that there will be a delay in renewing appropriations until Congress completes its deliberations, then subproject milestones will be "pushed downstream." Even long-term, steadily funded projects face this kind of hiatus since legislative changes in the original plan are usually made after work is underway. In the same vein sponsors may interject other demands into the job flow thereby destroying the schedule. Likewise, unexpected technical problems come up in the course of meeting milestones, and the resolution of these contingencies generally require extra time. In short, there is a wide range of unforseen events which can occur in the development of any weapons system.

Another factor to be evaluated in the setting of milestones is the quality of manpower resources. This point ties in with the earlier discussion of experience in that a manager who knows the capacity of his

employees can set more realistic milestones. Thus, given a certain number of people to carry an assignment, the scheduling of various completion dates for subjobs depends upon the manager's assessment of how well each subordinate alone and in combination with co-workers can perform particular functions. Different groupings of employees could produce a different set of milestones, and in any case the human equation becomes an important input in the calculation of time posts.

If the impact of the preceding parameters is correctly predicted or taken into account, MBO can obviously be a highly effective process which reaches goals on time, and in order to achieve this end many Dahlgren administrators quantify project objectives by using the Program Evaluation and Reporting Technique (PERT). However, experience indicates that there are inherent disadvantages and limitations involved in applying available methods of quantification to the derivation of milestones. Using PERT confronts the problem of not being able to measure estimates accurately because seldom, if ever, does the decision-maker have hard data upon which he can base his computations. Therefore, he estimates on the basis of experience and "gut instinct" a pessimistic, optimistic and most likely time of completion for each subproject, and the result is nothing more than the average of subjective reasoning. Thus, while present techniques for setting milestones are ostensibly impressive displays of mathematical formulation for management science, the Dahlgren survey proved that they are barely adequate measures of reality. Research and development work in the defense establishment clearly needs more sophisticated tools for comprehending variables such as contingencies, situational disruptions and unforseen events which are responsible for erroneous calculations.

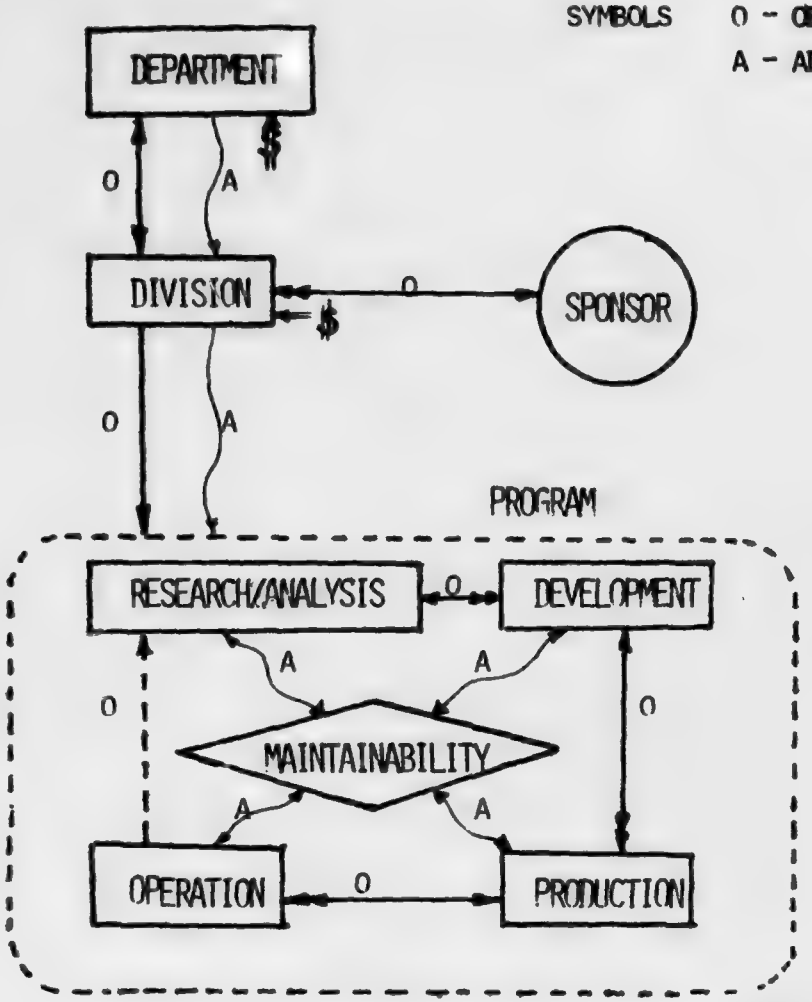
E. Organizing for MBO in Navy R and D

Among the factors that overall make MBO an effective process at the Dahlgren Laboratory are:

1. strongly motivated and visible personnel who have a genuine desire to provide excellent service to the Navy;
2. active participation by professionals in many components of the base in the formulation of objectives;
3. extensive and successful managerial experience in directing projects of varying size and scope;
4. a concept of organization that maximizes the use of personnel and resources.

None of the above mentioned elements are mutually exclusive but at the same time the importance of the organizational concept cannot be emphasized enough because it provides the basis for efficiently completing objectives especially at the division, branch and project levels where such problems as the diversity of tasks, instability of certain programs, interplay between personal and organizational objectives and variety of sponsor-laboratory interfaces can impede accomplishment. Although different arrangements are used to accommodate various needs and situations, enough units of the Dahlgren Laboratory employ the same basic theory to permit designing a generalized model for organizationally achieving management by objectives.

This model (see Figure II) represents not only an effort at satisfying the Civil Service policy which requires a formal organization with a delineation of positions having managerial responsibility but it also incorporates many features of informal organization in that jurisdictional distinctions are rendered less rigid by a meshing of the



OBJECTIVES

Broad a) Base through Dept. Mission
b) Sponsor's requirements

Specific - Defined by Division and negotiated with sponsor

MILESTONES

Defined by Division and Negotiated with Sponsor- Reported to Department.

EVALUATION

By a) Validation and Verification (V&V)
b) Final Product Performance

MOTIVATION

Desire to serve fleet, Pride in work,
Recognition by Peers & Management,
High level of participation in goal setting,
Observe entire project "cradle to grave".

Figure II

Organizational R & D Model for MBO

branches in the performance of work. Moreover, by carefully planning a logical concatenation of the milestones to be met in completing a project this form of organization in effect functions as a cybernetic loop which automatically establishes and maintains unwritten policies for personnel evaluation and product control through the constant verification and validation of results that takes place as each part of the project makes its transition from one branch into the next. Omitting specifically stated productivity guidelines has proved advantageous in that this method may actually achieve higher than expected levels of work because the cycling of tasks generates a competitive atmosphere in which most organizational members strive for top quality output. In addition the operation of the cybernetic loop simplifies the MBO process by naturally defining prerequisites such as performance standards, thereby eliminating the separate time-consuming processes that are normally used to formulate work requirements.

Although the model is particularly well-suited for a long-range, steadily funded project, it is capable of handling other programs which may be a combination of variables such as high risk, multi-faceted, short-term and so forth. In any case the success of this configuration depends upon the involvement of the various organizational levels in setting objectives so that there is a widespread understanding of the intermediate and long-range goals. For explanatory purposes the model presented here is based upon a divisional setup which is broken down into branches. It could, however, be the blueprint for a department which is arranged by divisions or for some similar system.

The mode of operation for the model is that when a new project comes on board or is being planned, the research/analysis branch generates

concepts, ideas, theories and so on. As this initial stage progresses the other branches are consulted as to the feasibility of whatever is being researched in order to keep the work within the framework of the overall project. At the point where it becomes evident that theoretical research is ready for the test of applicability, the development branch becomes involved working in conjunction with the research/analysis branch until the requirements of theory have been satisfied. Then the idea will be converted into a viable product with frequent consultation with the production branch so as to maintain feasibility. As soon as the development work passes from conceptual to practical status the next branch enters the scene for the purpose of gradually phasing the project into production. At this point close attention must be paid to the milestones leading to the delivery or due date. For this reason the operations branch will become actively engaged in at least closely observing if not directly participating in the production stage of the project cycle. When the final product passes the preliminary tests, which are conducted in cooperation with the operations branch, it is then taken over by the latter who completes testing for serviceability and readies the weapon system for use by the fleet. Throughout the total process the maintainability branch assists the others in solving problems and in"trouble-shooting." Periodically, it also makes independent tests to provide another evaluation for comparison with the results of regularly scheduled trial runs.

The cybernetic loop is completed by the operations branch which conducts follow-up checks on the projects turned over to the fleet. These inspections are primarily for the purpose of correcting difficulties of malfunctions that are encountered during manuevers, but at times this

interface also regenerates the cycle as new ideas or the means and ways of improving the weapon system are discerned by the Dahlgren personnel or recommendations are received from representatives of the fleet.

The preceding description of the organizational model has been simplified in that only the process for a single project has been used. In practice, however, this arrangement is capable of simultaneously handling a variety of tasks under disparate timetables. This flexibility is achieved by dividing the branches into groups or teams to which different program responsibilities are assigned. Therefore, a number of cycles concerned with separate projects and different milestones may be operating at the same time within the framework of the division whose chief coordinates all effort by using MBO.

V. Conclusion

During this study it became evident that although management by objectives offers many advantages not found in other administrative theories, the process could degenerate into a confusing and meaningless production of paper. To avoid much of this problem, the Dahlgren Laboratory has issued clear statements of what are the program goals for the entire laboratory thereby restricting the formulation of objectives at the lower levels to defined categories of project activities. In this way ancillary objectives concerning personnel actions, support functions and so forth are being eliminated from the basewide MBO policy except when they have implications for the entire organization. In an attempt to streamline the process the responsibility of MBO coordinator has been assigned to a staff officer. His duties in this respect include

compiling a detailed list of departmental objectives from which he prepares a digest for the board of directors and checking for conflicts, duplications, inconsistencies, overlaps and the like which must be resolved by top management. So far the experience of the coordinator indicates that MBO will work best when there is a central point for collating the results of the process. In time the Naval Surface Weapons Center of which the Dahlgren Laboratory is one part will have centerwide control over the MBO systems of its members, and it appears that the Navy Department will coordinate the objectives formulation process among its research laboratories. Clearly, the top to bottom organizational involvement in MBO provides an information flow which can establish centralized policy with decentralized management in a way and to a degree heretofore unattainable.